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Keynote Address: Statistics and the Environment

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"Keynote speech" is defined by Webster as "a speech, as at a political convention, that sets forth the main line of policy." While that is an admirable definition when visualizing the political process, the definition seems strangely misplaced here. Not only would it be presumptuous of me to attempt to set policy for the organizations represented here, but this gathering hardly resembles a political convention. There are no banners, there is no music, the ambient level of smoke in this room seems rather low, and I doubt if any votes are to be taken.

Scientists rarely engage in any of the ballyhoo associated with the political process. The rewards of scientific endeavor are found largely in the endeavor itself and in the recognition of accomplishment by one's peers. Certainly those rewards are honorable and have played an enormous role in fostering scientific advances throughout history.

But I wonder if the image of the scientist tucked away in his laboratory, speaking a language often known only to himself and his peers, should not be changed and changed dramatically. Quite frankly, I find myself longing to attend a scientific meeting that more closely resembled a political convention. While

obviously a symposium like this is no place for much of what goes on every fourth year, political conventions do serve the very important function of rallying members of each party around a central theme. In that respect, perhaps a bit more of the political convention atmosphere might be in order in scientific meetings. And if I were to choose a theme to rally behind, it is that the scientific community must strive to make itself more visible and available to policy makers than it has in the past. My specific frame of reference is the Congress and that is the essence of the theme I would like to develop this morning. The Congress has a pressing need for solid scientific advice, and it has been all too hard to get in the past.

Before developing this theme in more detail, it might be helpful to describe my role on the staff of the Committee on Commerce. Perhaps then it might be easier to understand my feelings about good scientific advice and its role in the legislative process.

My job is primarily to offer technical advice which is relevant to the formulation of regulatory policy on certain environmental matters. Stated differently, it is my function to attempt to under-

stand environmental threats and then to translate this understanding into legislative language that hopefully will provide appropriate remedies. My job is not substantially different from those of other staff members on the hill. Identifying problems and proposing legislative remedies is a function shared by most committee staffers, although my area of specialty probably requires a greater understanding of scientific principle than others.

In one respect, however, my perspective differs substantially from that of many of my peers on the hill. I do have a degree in fish and wildlife biology and engaged in that profession for a number of years before joining the staff of the Committee on Commerce.

This does give me a certain uniqueness which is not at all unwelcome. At certain times, however, I find this piece of personal history to be more a hindrance than a benefit. Unfortunately, many of my lawyer peers regard anyone who might even remotely be termed a "scientist" an automatic expert on everything from thermodynamics to biostatistics, both of which, incidentally, I have been called upon to speak in the past. I would find this tale somewhat amusing were it not for the fact that it illustrates a very serious lack of technical expertise available to Congress.

As we all know, a great deal of legislation to protect the environment has been proposed and enacted in the past few years. Far-reaching legislation to protect our air and water resources has become law, as has tighter control over noise, radiation, ocean dumping, and the protection of other components of the living environment. In each case, and I really am not aware of any exception to this rule, the enactment of a statute has occurred only after scientific facts or alleged facts have sounded the alarm. The death of Lake Erie and the disastrous effect on biological systems of the polluted waters of the Houston ship channel and the Cuyahoga River created strong pressures for the enactment of a stiff water pollution control law. The

effects, or potential effects, of air pollution in the smog-filled Los Angeles Basin and Washington, D. C. for that matter, created strong motivation for the enactment of the Clean Air Act amendments of 1970. Within my sphere of responsibility, the discoveries of polychlorinated biphenyls in edible chicken and the effects of phosphates on aquatic eutrophication have provided much of the impetus necessary for Congress to focus attention on the Toxic Substances Control Act, which, hopefully, will become law in the near future. Likewise, a survey conducted by EPA entitled "The Community Water Supply Study" has provided much of the ammunition to shepherd the Safe Drinking Water Act through the Senate.

The common thread among all of those examples is that each of them requires at least a rudimentary understanding of the effects of pollutants on biological systems.

Obviously, the importance of scientific input goes far beyond the bounds of environmental legislation. Health legislation, foreign affairs, housing, drug abuse, agriculture, fiscal and monetary policy, and many other areas of legislative endeavor would be doomed were it not for the lynch pin of technical input at some point in the legislative process.

The formulation of scientific fact and its translation into terms laymen can understand is a fundamental need of an aggressive Congress. Much of the reluctance that we find in Congress to developing specific policy directives in matters of science results from a lack of understanding of the scientific principles involved. For example, a key issue for the House and Senate Conference on the Emergency Energy Act was the degree of discretion to be given to the President to impose emergency energy conservation measures. If better information were available to the Congress on the effectiveness of the various measures contemplated, one can legitimately question whether the issue of how much power be given to the President might cease to be an issue at all as Congress

would take the initiative. To carry the principle to its logical conclusion, might not the lack of technical input and understanding of technical information by the Congress be a prime factor leading to the very substantial transfer of authority from Congress to the Executive Branch in recent years.

It is perhaps unfortunate that often the predominant scientific input to the legislative process comes from those who are most vociferous. While assertiveness is an admirable quality, the essential ingredient of impeccable scientific credentials is too often difficult to discern. As many of you know, it is a staff responsibility to seek out witnesses for Congressional hearings. In structuring hearings involving matters of scientific principle, there is no more difficult task than finding respected scientists who can speak on an issue forcibly and in layman's terms. The frustration becomes overwhelming after supposedly having found such a witness and listening to thirty minutes of excellent scientific testimony, the Chairman of the hearing turns to the staffer at his elbow and asks under his breath, "What the hell is he saying?"

Lest these comments be interpreted as undue criticism of the scientific testimony we do receive, I have nothing but admiration for those scientists who volunteer time and time again to offer testimony to the Committee. Despite this, however, all too frequently we are forced to call upon the same witnesses to address themselves to a variety of issues, some of which they are obviously the more qualified to speak to than others.

The disparity in the amount and types of technical support between the Congress and the Executive Branch is indeed staggering. For example, Dr. Stanley Greenfield has nearly 2,000 employees at his disposal to carry out the research and monitoring functions of the Environmental Protection Agency, one of the smaller agencies of the Executive Branch. In fact, over a quarter of a million persons are employed in technical positions in the entire Exec-

utive Branch. On the other hand, the standing committees of the Congress, who are responsible in large part for escorting legislation through the legislative process, employ approximately 1,500 people. Obviously, the duties of the Legislative and Executive Branches are not comparable. But there is little wonder in my mind as to why the support of the Administration is so very important in passing legislation which requires scientific understanding. Quite frankly, we are unmercifully out-gunned.

Obviously, there are some institutional changes which Congress must consider to narrow the technology gap. In fact, a number of changes are already evident. As many of you know, the Congressional Research Service of the Library of Congress has long provided technical research service to members of Congress. Their staff is highly overtaxed, however, and emergency requests can rarely be honored.

The Congress has established an Office of Technology Assessment within the Library of Congress. The purpose of OTA, now in its formative stages, is to aid Congress "in the identification and consideration of existing and probable impacts of technological application," obviously a vital service.

The General Accounting Office, Congress' so-called watchdog agency, is made up largely of technical experts whose function it is to audit government programs which many times are technical in nature. Again, a vital function.

On the non-governmental side, there is evidence that scientific and professional organizations are gradually turning their attention to the Congress. The American Association for the Advancement of Science (AAAS) sponsors several Congressional fellows each year as does the American Society of Mechanical Engineers (ASME), the American Physical Society (APS), and the Institute of Electrical and Electronic Engineers (IEEE). The Committee on Commerce was blessed to have the first such

fellow, Dr. Barry Hyman of George Washington University, assigned to the Committee this past year. Dr. Hyman played a substantial role in the Committee's consideration of the National Fuels and Energy Conservation Act and other energy legislation. Dr. Hyman has agreed to join the staff for an additional year and to assume staff responsibility for the Subcommittee on Science, Technology, and Commerce.

Obviously, the prime responsibility for obtaining technical information pertaining to legislation must lie with the Congress. But should the responsibility end there? What should be the role of the scientific and professional organizations like many of those sponsoring this symposium? And how about the role of the National Academy of Sciences, whose name has become synonymous with scientific excellence in this country, at least in most circles. Is there not a responsibility to make your voices heard loud and clear in legislative matters involving science? And I am speaking about a great deal more than lobbying to keep research budgets at such and such a level, although that role obviously is vital. I am talking about taking some lessons from the public interest movement and aggressively involving yourselves throughout the legislative process in matters ranging from the regulation of the chemical industry, to oc-

cupational safety and health, and perhaps more to social issues which bear on science, like the manner in which the fruits of science (like certain pesticides) are to be used in warfare. Obviously the list of potential legislative matters in which you could involve yourselves is very long.

Keeping abreast of Congressional activity and offering your services not only to those who actively seek help, but to those who might reluctantly accept it, can only foster a greater understanding within the Congress of science and scientists. For the scientific and professional organizations, this could well involve staffing a national office here in Washington as some have recently done and employing sufficient competent lobbyists and staff to make your point abundantly clear. It is a difficult, often unrewarding task, but one which stands to yield substantial benefits.

To complete this exhortation, let me depart from a promise I made at the outset of this talk, that of not being presumptuous enough to attempt to set policy for this symposium. As you continue for the next three days and after you go back home, I would hope that each of you would continually ask the question, "Do I have knowledge that has legislative application and might it help to set policy if it were known to the Congress?" If you decide in the affirmative, please let us know.